REMARKS

The examiner required a new title. The title is amended to more clearly indicate the invention.

The examiner rejected the claims as indefinite under 35 U.S.C. 112. These claims were translations from claims written in accordance with European practice. The only two independent claims, claims 1 and 2, have been canceled and replaced by new claim 31. Dependent claims are also amended.

Paragraph [0039] was amended to correct a translation error. The term SDC was erroneously substituted for the term DRC during the translation. DRC appears correctly in the original German language specification at page 10, line 26. Therefore, the paragraph was amended to conform to the original German specification so that it would be correct.

Paragraph [0062] is also corrected for a translation error.

The examiner initially rejected the claims under 35 U.S.C. 103(a) as unpatentable over Yamakado, et al. Claims 1 and 2 have been canceled. Claim 31 is added as a substitute for claim 2. Claim 31 is the only independent claim. The claims as now presented are allowable for the following reasons.

Printing machines commonly have many axles for many rollers that feed paper through a printing machine. Each axle is driven by a drive unit that must be controlled. They also have many other devices and functional parts that are driven by a drive, such as a motor. For example, they have functional parts that operate with linear motion, that is they operate along a linear axis, and may be driven by a linear motor. Additionally, they

have devices or functional parts that operate along other axes that must be controlled. In summary, printing machines have many devices or functional parts that are driven by drive units and therefore have many axes to control.

Furthermore, modern printing facilities typically have multiple printing machines for performing different operations. Each machine has many, many such functional parts, axes and drive units. For example, one machine may do the printing, another machine may do folding. There may be other machines to supply paper, collate, fasten bundles or package. Each of these machines typically has multiple drives with axes that must be synchronized and their position, speed or acceleration must be controlled. Control is accomplished in the prior art and by applicant by means of computer control. However, applicant's network and information communication components for controlling the drives of the functional parts is different and not shown in, or obvious from, the prior art.

One advantage of applicant's invention, as described more fully in the specification, arises because it is desirable to minimize the amount of cabling required for the control system. That minimization is particularly difficult for large, complex machines with many such axes for their many controlled functional parts. It is also desirable that: (1) the entire printing system not be disabled whenever a particular component becomes inoperable or is removed; (2) the system be capable of being easily expanded as new equipment is added and be able to extend over larger distances; and (3) any part of the system be in communication with other parts. To accomplish these desirable features, the topology or layout of the system becomes important. A simple and obvious system would be to have a central computer with individual communication

connections hardwired to each and every drive unit for controlling each and every axis. This would be a star or hub-and-spoke topology (hereinafter referred to as a star network). In this topology the main computer has direct connections to each of several things being controlled. While this topology is practical for smaller printing operations, when used for larger printing operations extending over a considerable floor space, a star network requires an enormous amount of wiring and has other disadvantages. For example, it requires a wire or bus from the central computer to each controlled drive unit. This means many parallel conductors going all the way from the central computer to each machine.

The Yamakado reference shows a computer control system but it is different from applicant's. Yamakado shows a controller 2 [MA] connected by "interface" 4 to each printer in a star network for synchronizing the printers. A "host" computer 1 is also connected to each of the printers through "interface" 3 for supplying print data and print commands. Reference to Fig. 2 shows that the host 1 is connected to the printers in a ring network.

Applicant does not do that. Applicant has a combination of cooperating networks in a different configuration. Applicant, like the prior art, has a plurality of printer drive units and other functional parts that are being controlled. However, applicant's printer drive units and other functional parts are connected in a plurality of drive networks (preferably ring networks - claim 3). In other words, one group of printer drive units or other functional parts are in one drive network, another group of printer drive units or other functional parts are in another drive network and there may be additional groups of

printer drive units or functional parts connected in additional drive networks. Each drive unit is a node in its drive network. One of these nodes is a master in each drive network and the others are slaves so that these drive units can communicate according to known master/slave principles. So, in summary, one part of applicant's combination is multiple drive networks and each preferably communicates within its drive network according to master/slave principles.

A second part of applicant's combination is a second group of networks which form intercommunication networks that preferably communicate with each other according to master/slave principles. The nodes of each intercommunication network are one node of each of the different and subordinate drive networks. In other words: there are a plurality of subordinate drive networks; each drive network has a plurality of drive units as drive network nodes; a node of each drive network is connected to a node of other drive networks through an intercommunication network and there are a plurality of intercommunication networks.

The third part of applicant's combination is that each intercommunication network is connected to a multi-link controller. In other words, the multi-link controller has communication components (communication interfaces) and each communication component is a node of each intercommunication network.

Therefore, in summary, the drive units are grouped in multiple groups. Groups of drive units are connected in multiple drive networks so the drive units within each network can communicate with other drive units within their drive network. Groups of drive networks are connected together in intercommunication networks so that drive

networks can communicate with the intercommunication network. All the intercommunication networks are connected to a multi-link controller so all networks, and therefore all drive units, can communicate with the multi-link controller. The invention subdivides the controlled drive units of a large, complex printing installation into several groups of drive units. Each group of drive units is connected in a drive network. Each drive network communicates to a node of an intercommunication network. There are a plurality of such intercommunication networks. Therefore, some drive networks communicate to one intercommunication network, other drive networks communicate to other communication networks. One node of each intercommunication network has a node connected to the multi-link controller.

One advantage of this is that every controlled component part does not need to be itself connected to a central controller or host. Instead, for example, the controlled functional parts of a machine, or a portion of a machine, are connected in a drive network, the controlled component parts of another portion of a machine are connected to another drive network, and there can be numerous such drive networks. Then, the drive networks are connected together by an intercommunication network which, in turn, is connected to the multi-link controller. This minimizes the cabling because neither the drive units for each functional part nor the drive networks are connected directly to a central controller or host. The intercommunication networks are connected to the central, multi-link controller.

Another advantage of applicant's invention is that a failure of one part of these networks does not interfere with or prevent the operation of the other parts in other

networks. In other words, if one drive unit fails, communication to other drive units is not affected. If one communication network node fails, communication with the other nodes of the communication network are not affected. If one communication component of the multi-link controller fails, communication with the other intercommunication networks is not affected. Similarly, if, instead of a failure, one of these parts needs to be serviced or replaced, it can be disabled or removed without affecting the other parts.

Applicant's combination can be enlarged and extended without connection all the way back to the controller or a host. Drive units can be removed without interrupting the operation of the networks. A new drive unit can be connected to an existing drive network, or a group of new drive units can be connected to an existing intercommunication network. New intercommunication nodes can be added for new drive networks. New intercommunication networks can be added.

The controller of the Yamakado reference is only used to connect printer controllers with other printer controllers and to the host. The multi-link controller of applicant's invention connects a plurality of intercommunication networks; that is, applicant's multi-link controller connects one intercommunication network to other intercommunication networks. This provides substantial flexibility because the intercommunication networks can be associated with (allocated to) different functional parts of a machine any way chosen by a designer. The functional parts of a machine can be associated with one intercommunication network and the functional parts of other machines associated with another intercommunication network. Alternatively, a large machine may be subdivided into groups of functional parts, each group connected in a

different drive network, and the drive networks connected to an intercommunication network. For a very large machine or for a group of machines, there can be multiple intercommunication networks, each with multiple drive networks, each drive network having multiple drive units.

Applicant agrees with the examiner that Yamakado shows a multi-link controller 2 connected in a star-like configuration to printers PR1-PR4. However, this configuration is simply a single star network. It simply connects each drive to be controlled directly to the multi-link controller. The multi-link controller of Yamakado is a single node of a single star network. Yamakado has the disadvantages, described above and in the specification, that applicant's invention overcomes. Yamakado does not show a multi-link controller with communication components that are nodes of a plurality intercommunication networks, with each intercommunication network having as its nodes a node of each of several drive networks, with each drive network having a different group of drives as its nodes.

Yamakado does not show anything that would suggest to a person of ordinary skill in the art the idea of grouping and connecting a plurality of drive units in different groups, with the drive units of each group connected in a drive network so there are a plurality of drive networks for communication. Yamakado also does not show anything that would suggest to a person of ordinary skill in the art the idea of also connecting some of the drive networks together as an intercommunication network, and a different group of drive networks together as another intercommunication network so that there are a plurality of such intercommunication networks. Yamakado also does not show anything

that would suggest to a person of ordinary skill in the art the idea of also connecting each of the intercommunication networks to a multi-link controller. Yamakado only shows (1) a chain-like link between the mechanical components "mechanical controller" and "reversing unit" and (2) an "independent" single bus-like drive network wherein the common bus 4 links the several electronic controllers of the printers PR1-PR4 to a single host computer system 1 in parallel.

Applicant's invention controls the position, speed or acceleration of functional parts. The examiner cited paragraph [0034] of Yamakado as showing that. However, applicant's attorney finds no reference to those parameters or any parameters. Paragraph [0034] of Yamakado does say that a controller controls a mechanical part. However, that can be merely turning a part on or off and says nothing about controlling position, speed or acceleration.

Yamakado also does not show the use of ring networks to connect multiple drive units into multiple drive networks combined with an intercommunication network to connect the drive networks together for synchronizing the drive units.

Therefore, the claims are believed now allowable and reconsideration and allowance are respectfully requested.

The Commissioner is authorized to charge Deposit Account No. 13-3393 for any insufficient fees under 37 CFR §§ 1.16 or 1.17, or credit any overpayment of fees.

Respectfully submitted,

4/7/05
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Last printed 4/7/2005 9:23 AM
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